Today's Fresh Tomato Marketing System and a Perspective of a System for the Future

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ABSTRACT

This paper discusses the present marketing system for fresh tomatoes and presents a concept for a new system. The concept involves development of a tomato cultivar that produces all of its mature fruit at the same time, a semimechanical unit that both harvests and packs the tomato, and a package that can be filled in the field and delivered to the retail store. Costs of the two systems are compared.

KEYWORDS: Fresh tomatoes, harvesting, packing, systems.

CONTENTS

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TODAY'S FRESH TOMATO MARKETING SYSTEM AND A PERSPECTIVE OF A SYSTEM FOR THE FUTURE

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INTRODUCTION

A nationwide consumer survey found that 84 percent of 2,600 households indicated the family members preferred fresh tomatoes over 25 other vegetables (5). A similar survey, however, found that the consumers were dissatisfied with the fresh tomatoes purchased in retail stores (4). The primary causes of dissatisfaction were softness, decay, and taste (4). The message is clear that consumers like tomatoes but have difficulty in obtaining the quality desired in retail stores. This may explain why the consumption rate of fresh tomatoes has not changed in the past 9 years (3), even though our society is more affluent, knowledgeable, and decidedly more interested in fresh vegetables than ever before.

A ripe, quality tomato should have normal shape, red color, no objectionable defects, and no internal or external bruising. The fruit should be red throughout and firm enough to give an intact slice. The gel should be red, and the fruit should have no off-colored seeds, watersoaked locular or wall tissue, or yellow slimy materials in locular areas.

The main objective of this paper is to propose a feasible, profit-making, fresh-tomato marketing system that would give the consumer a good-quality fresh tomato. The proposed changes, if introduced, should improve the quality of tomatoes on the market, cut costs, and cut waste. To introduce the proposed method will require the cooperation of engineers, postharvest researchers, growers, distributors, and retailers.

TODAY'S SYSTEM

Culture and Harvest

Fresh tomatoes retailed in the United States are grown either staked (trellised) or unstaked in production areas in Florida, California, and Mexico and are harvested mainly by migrant labor. About 80 percent of the tomatoes are harvested in the "green stage." Studies have shown a good picker can pick 17 tomatoes a minute (14). The fruits are generally picked into plastic buckets, then dumped from the buckets into padded 4- by 4- by 2-foot wooden bulk bins with a capacity of 1,000 pounds. In the 1974-75

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season a 30-pound box of tomatoes at shipping point in Immokolee-Lee area of Florida cost $2.22 to grow staked, and $0.52 to pick (2). The fruit were transported by truck to packing houses 5 to 150 miles away.

Prior to harvest the quality of the fruit is probably as good as can be produced. The volume of fruit picked allows no time for quality decisions by the picker. Fruits with defects such as catface, deformity, or cracks, or fruits with blossom-end rot, gray wall, or decay can comprise 20 percent or more of the harvest. Fingernail cuts, stem punctures, scarring, and scuffing originate at harvest. The dumping of harvested fruit into bulk bins, the weight of fruit on fruit, and movement of the tomatoes during transport from field to packing house can cause both external and internal damage to the fruit. The damage shows up as scuffing or sand scarring of the skin, cracking, or internal bruising of the fruit. External blemishes not only detract from the appearance but increase the chance of decay. Internal bruises are not always visible externally, but can cause fermentation and off-flavors in the fruit. Internal damage can also manifest itself later in the ripened fruit as soft, water-soaked, disoriented, and sometimes discolored tissue.

Packinghouse Operations

At the packinghouse the bulk bins are weighed, unloaded by forklift, and assembled in a holding area until a sufficient quantity of bulk bins of a particular grower accumulates. All the packing lines are cleared of fruit of the previous grower's lot prior to a new grower's run. The bulk bins are then moved by forklift to an automatic bulk-bin dumper. The bulk bin is tipped to about 110 degrees and shaken slightly, and the fruit are dumped into a tank of water 50 feet long by 7 feet wide and about 4 feet deep. The water is circulated and chlorine is added to lower the bacterial count. These tanks are cleaned periodically. The tomatoes are flumed into an inclined chain belt which conveys the fruit into the packinghouse and at the same time removes plant debris. The "breaker fruit" and riper fruit are sorted and conveyed to the "vine ripe" line for grading and packing.

The green tomatoes are washed with high pressure spray, then waxed and polished. Fruit are conveyed over a series of leather belts with different diameter holes. As the fruit are conveyed, they drop through the different size holes onto other belts that convey the sized fruit to the grading table. There are six size designations, but most commercially sold tomatoes are medium, large, or extra large.

As the tomatoes pass on conveyor belts, 20 to 40 persons grade them for decay, sunburn, cuts, shoulder scars, sunken discolored scars, growth cracks, bruises, broken skin, puffiness, catface, insect damage, hail injury, chilling injury, deformity, correct size class, and maturity.

There are 4 USDA grades of fresh tomatoes (U.S. No. 1, U.S. No. 2, U.S. No. 3, and U.S. Combination) (15). Usually, tomatoes are graded so that a given lot will contain a specified percentage of the U.S. No. 1 grade (3). U.S. No. 1 allows 15 percent defects at destination (repacker), so the packer can ship tomatoes that will be within these limits at destination. The

percentage of defects or the severity of defects can be even higher if the buyer decides to buy a modified U.S. No. 1 grade, i.e., a specified proportion of the U.S. No. 1 grade. Of the tomatoes sold fresh in the United States, only those grown in Florida and foreign countries require a Federal grade.

After grading, the tomatoes are routed according to their specific size and grade for automatic box filling. The boxes are automatically weighed during filling. The box is also coded for grade, size, and grower number. A reflectance tape is applied at a specific height on the corner of the box for later electronic sensing to route the box into its proper category for palletizing. The boxes are palletized, 42 per pallet, and moved by forklift to assembly areas.

The green tomatoes in a grower lot do not all ripen at the same time. There are slow ripeners called "immature" that require as many as 21 days to ripen to pink, fast ripeners called "mature green" that ripen in less than 7 days to pink, and others that fall between these classes. There is no commercially available, nondestructive method for separating the crop into these categories at harvest. The trade, of course, would like 100 percent "mature green."

Because of the difference in ripening rates, a high percentage of the green tomatoes packed in Florida, California, and Mexico are treated with ethylene gas to speed the ripening process and, supposedly, to induce uniform ripening of the various fruits in the lot. The gas used is chemically the same as that produced naturally by ripening tomato fruit. Ethylene is nontoxic and is used at concentrations of 200 to 10,000 parts per million in explosion-proof, airtight rooms. The rooms, generally large enough to hold 2,400 30-pound boxes, are maintained at 21.1°C and high relative humidity during gassing. The duration of gassing is 24 to 72 hours, depending on the degree of ripeness desired by the repacker.

Cullage rate at the packinghouse depends on the condition of the fruit and the selected grade to be packed. The cost of packing increases with cullage rate (6). The higher the cullage, the less the grower gets for the fruit packed from his lot. The cost of grading and packing a 30-pound box is $0.97. The cost of handling, selling, and ethylene treatment is $0.53 a box. The shipping container costs $0.75 to $0.80.

The quality deterioration of the green tomato begins with injury at harvest (8) and continues during its highly mechanized handling in the packinghouse (9). Injury occurs internally and externally. Stem scars, blossom scars, and skin cuts are entry ports for decay-producing organisms as well as other foreign material. Such entry is facilitated in the wash-water tank, even though chlorine is added to minimize microbial populations. The possibility of infection from other tomato decay organisms not affected by chlorine and the probability of absorption of water into the fruit could account for some of the internal decay. The multiple handling and dropping of the fruit during the grading and sorting operation cause external and internal damage to the green fruit.

In 1974, a study done in California indicated that, of the shipping cartons examined at shipping point, 55 percent of the fruit had some type of mechanical injury (9).

Use of ethylene gas is an attempt to hasten the ripening of the slow ripeners and have them pink in 7 days, but in the process the fast ripeners become overripe. The overripening of the "mature green," the higher quality fruit, increases their susceptibility to bruising and decay and shortens their shelf life. The ethylene treatment does not hasten the ripening of the "immature greens" in the 7 days, as desired by the repacker.

Transportation--Shipping Point to Repacker

The normal truckload is 1,200 30-pound cartons, hand-stacked in a pattern to allow proper air movement for maintaining desired fruit temperatures during transit. The normal shipping period from Florida is 24 hours for a 1,000-mile delivery, and the cost per 30-pound carton is about $1.00. Recording thermometers are rented by the buyer to monitor the transit temperatures. Tomatoes are generally shipped by truck but are also shipped by rail, mostly from California and Mexico to eastern markets.

Bruising can occur during transit from the pressure of the fruit resting on each other in the bulk-type fiberboard box, plus the movement of the load. A study of Florida and California tomatoes shipped by rail showed that 34 to 83 percent "pink" and "firm ripe" tomatoes and 1 to 15 percent of "green" tomatoes had objectionable bruising both internally and externally on arrival at the repacker (12). The cost of handling and transporting tomatoes from repacker to distribution center and then to retail store is estimated at 5 cents a pound.

Repacker

The fruit at arrival are not all ripe enough to package; thus, the repacker sorts them, packages the ripe tomatoes for retail sale, and holds the rest for ripening. This process must be repeated, so some fruit are rehandled as many as three times before being packaged into consumer units. Handling is not usually gentle and involves fruit that are riper and more easily bruised. The loss of fruit due to culling of bruised, decayed, or out-of-grade fruit has been reported to be 18 percent at repacker level (11).

The consumer units are film-overwrapped in three- or four-fruit plastic trays. The trays are hand-packed in 10-tray master cartons, and these are palletized and transferred by forklift to trucks for delivery to a distribution center.

Repacking cost per 1,000 pounds ranges from $37.00 for a repacker with 1.5-million-pound capacity to $29.00 for a repacker with 10-million-pound capacity.2/

2/ Cost figures are updated to 1977 from Meyer (11) by applying an inflation factor of 6 percent for 14 years.

Distribution Center and Retail

At the distribution center the tomatoes are assembled with other produce and grocery items for delivery to the individual retail stores. Thus, they are, again, handled and reloaded into trucks. On arrival at the retail store the product is rehandled in the unloading. At the retail store the trays are removed from the master cartons and stacked three deep on either refrigerated or unrefrigerated display racks. Five different containers have been used in the movement of the fruit from field to retail store. The cost of each container is as follows: plastic picking basket $5.00, bulk bin $30.00, 30-pound fiberboard shipping container $0.80, plastic tray and overwrap $0.03, and master container for trays $0.13. Of these containers only the last two effectively protect the tomatoes from physical damage. Ironically, most of the damage to the tomato occurs before it is packaged in a protective container.

We have traced the movement of tomatoes from field to retail market. We acknowledge that the system does deliver a product at prices competitive with those of other vegetables. But quality is lost as a result of excessive handling (1, 8, 9, 11, 12, 16).

PROPOSED SYSTEM

We propose the use of an preharvest fruit washer and semimechanical harvester/packer (SMHP) for improving the quality of fresh market tomatoes.

The preharvest fruit washer will be a modified, conventional high-boy sprayer. It will have dual usage: cultural spraying of insecticides and fungicides, and preharvest washing of fruit.

The SMHP will be a self-propelled, totally hydraulic system, powered by a diesel engine. The chassis will be steel, with fiberglass or high-impact plastic where the strength of steel is not needed. The frame will consist of a ground level and a top level. For transport on main highways on tractor-trailer beds, the frame will need to be collapsible, both horizontally and vertically. Length of the SMHP will be about 30 feet, and the ground-level width from wheel to wheel will be 11 feet when fully extended and 6 feet when collapsed. The top level will be 2 feet wider and 3 feet longer than the ground level. Total height including the roofing on the top level will be about 12 feet when expanded and 9 feet when collapsed. The tires will be the wide flotation type. Total weight with personnel and product will be about 10 tons. The speed of operation will be about 2 miles per hour. The projected cost of each SMHP is estimated at $125,000. The cost for the research and development of the SMHP is estimated at $450,000.

The SMHP will straddle a 3-foot bed containing three rows of staked tomato plants (10). Planting in the rows will be staggered. For greatest harvesting efficiency and use of manpower, specific picking areas for each picker will be assigned. Thus, at ground level, six picker/graders will be located at equal intervals on each side of the SMHP. Each picker/grader will harvest breaker and pink tomatoes from a specific area of the plant. The following illustrates the harvesting sequence on one side of the SMHP: Picker/grader 1 will harvest fruit in the top half of the row to his right. Number 3

will harvest fruit in the bottom half of the same row. Number 5 will also harvest from his right but along both top and bottom of that half of the middle row closest to him. Picker/graders 2, 4, and 6 will harvest correspondingly from their left.

As the picker/graders harvest, they will grade the fruit into three classes: (1) Fruit meeting high quality standards, (2) fruit that are salable but do not meet the high quality standards, and (3) culls and decayed fruit. The class 1 tomatoes will be conveyed vertically in automatic weighing cups to the upper level of the SMHP. Decayed and cull (class 3) fruit will be removed by picker/grader and placed in the chute to an open furrow where it will automatically be buried in the field. The class 2 fruit will be removed by picker/grader and will be conveyed horizontally to the rear of the lower level of the SMHP to be packed into bulk 30-pound returnable containers. The class 2 fruits removed on the lower level will not be trademarked but will be sold to local institutions, such as hospitals and schools, or to fast food outlets for use in salads and sandwiches where external appearance of the fruit is not as important as its nutritional quality, flavor, and lower cost.

The quality controller will continuously monitor the grading operation. Pickers will be checked for fingernail length and rough handling. All fruit from the controller's unit, which will consist of three SMHP's, will have a code number placed on master cartons to identify date, grower, and quality controller. At definite intervals and at the end of a row, personnel on the SMHP will be given 15-minute breaks. At this time supplies for the normal operation and maintenance of the SMHP will be replenished by the drivers of the distribution trucks. After each break the picker/grader and sorter/packer crews will be rotated so all can become proficient in both jobs.

The top level of the SMHP will have 12 sorter/packers--six on each side, each sorter/packer above a picker/grader on the ground level. A large sorting/packing table will be between the two sets of sorter/packers. The class 1 tomatoes will be automatically diverted into two packaging sizes by weight. The three- or four-fruit consumer packages for packaging the class 1 fruits (to be described later) will be fed to the sorter/packer from above automatically. The consumer packages will be coded prior to packing. The packed consumer units of three or four fruits will be conveyed to the rear of the top level for assembly into master cartons. These will be stacked on pallets and lowered hydraulically at the end of rows into waiting distribution tractor-trailers. Oversized class 1 tomatoes will be place-packed into a two-layer, 20-pound, returnable container. These high-quality, large-sized tomatoes will be sold to speciality produce merchandisers. The SMHP will have a canvas or a roll out aluminum roof to afford shade for both personnel and product.

Cultivar Selection

Ideally, a tomato cultivar(s) will be developed that will yield fruit with good flavor, uniform color and shape, good ripening characteristics (i.e., ripen from the inside out), good color, and resistance to disease and insects. The plant will be strong and flexible, and the stems jointless so that, when picked, the fruit will break away without the stem. Moreover, if the plant will flower and set fruit in mass, and thus produce fruit of the

same maturity at the same time, the SMHP could be supplied with a continuous flow of tomatoes. Such a flow would insure the efficient use of personnel and equipment.

Package Development

The packaging and containerization system must be developed so that tomato quality is maintained from field to consumer. Therefore, the consumer-size package must be structurally strong, lightweight, preassembled for field-packing, sealable, vented for efficient air circulation, compatible with the master container and delivery system, and designed so tomatoes are visible to the consumer. The master containers, which convey the consumer packages from field to retail store, should be reusable, easily cleaned, easily stacked in transport for good stability and air circulation, durable, and usable for retail display. Such master containers are already used for meat and bread products. The consumer package and master container must be so designed that they not only protect the tomatoes, but maximize the amount that can be hauled in the transport vehicle.

Transportation and Delivery

The proposed system will combine the four different transportation movements of today's system into one mode of transport from field to retail store. The transporting vehicle will also serve as a mobile advertising billboard to promote the produce. All new technological developments will be incorporated into the transporting vehicle to increase the quality retention of the tomato. All transport and delivery, as well as backhauls, will be computerized to minimize costs.

Education and Promotion

Short courses in lay language will be given to produce handlers and store managers so that they can be shown the adverse effects of poor retail-handling practices on tomato quality, their profits, and sales.

Because tomato quality is not easily determined visually, particularly if the fruit has internal damage, consumers need a standard to help them identify high-quality fruit. We believe a trademark would assure the same level of quality in repeat purchases. Trademarks have been used for many years by the processed food industry to build a reputation for products.

Operative Structure

The growing and marketing may be managed under one ownership, or the growers may prefer to be independent of the marketing functions. In both situations the growing of the tomatoes will need to be changed from the present system. The planning of production (10) and selection of cultivar will have to be compatible with the completely integrated marketing system, which will involve harvesting, packing, shipment, distribution, sales, and promotion. Nevertheless, the proposed system will allow the grower and marketer to work in their fields of expertise. Savings in equipment and labor costs, savings due to elimination of the multiple handling of the tomato, and a better product

should make the system competitive. Semiskilled labor, skilled labor, and professional personnel will be required (table 1). With today's computer capabilities all phases of the system could be easily programed so that accurate information necessary to conduct the highly complex integrated system at top efficiency would be obtained quickly (13).

Cost Analysis

The cost analysis of the proposed system was based on the following assumptions:

1. The tomatoes are of markedly better quality than those presently in the market.

2. The consumer is willing to pay a premium for the better quality.

3. Pickers are able to pick and cull (preliminary) at a rate of seven tomatoes per minute.

4. The daily production of each harvesting unit (table 1) is 34,560 pounds, with an additional 5 percent cull rate for a daily pack-out of 32,832 consumer units (1-pound packages).

5. Each master container holds 24 consumer units.

6. A fully loaded, refrigerated, highway trailer van is loaded with 960 master containers.

7. An average of 3.5 tomatoes are packed into each consumer unit.

8. Packaging materials per consumer unit cost $0.04.

9. The packing line operates at the same speed as the picking line so that neither line is delayed by the other.

10. The equipment is in operation for a 240-day season made up of 8-hour days. Annual costs are apportioned over the 1,920 hours of operation.

11. The over-the-road transportation is calculated on the basis of 1,000 miles from field to destination, plus 300 more miles for delivery to individual retail stores, plus 1,000 miles back to the field. A total of 128 man-hours for the team of drivers is required for this.

12. Operating costs for the tractor and trailer are $0.70 per mile, not including drivers' salaries.

13. Because no repacking is involved and the losses are substantially lower, the retailer is willing to operate with a margin that is less than his present margin.

14. The personnel of each harvesting unit are permanent employees and are paid premium salaries as compared to their counterparts in the tomato industry.

15. A harvesting unit consists of equipment and employees listed in tables 1 and 2.

As shown in table 1, picking and sorting labor costs comprise 61.3 percent of the estimated total labor costs for harvesting and packing proposed in our system. Fringe benefits are 16.6 percent of total labor costs per pound packed.

Table 2 details equipment required for one harvesting and marketing unit and shows ownership and operating costs per hour for this equipment. One harvesting and marketing unit requires an initial investment of $950,000. Hourly operating costs for the unit are $229.29, which is about $0.055 per pound packed.

Model costs are summarized in table 3. The tomatoes are "purchased" from the contract grower at $0.09 per pound. Labor, equipment, and materials costs to harvest, pack, and load are $0.239 per pound. Transport and delivery costs are $0.095 per pound. Overhead and other costs amount to $0.12 per pound. Total cost is about $0.55 per pound. The profit margin for the proposed system and the retailer's cost and margin increase the retail price to $0.76 per pound. But the price may well be lower because the profits from the marketing of the oversize and the lower-quality fruit have not been taken into account.

COST COMPARISON OF SYSTEMS

We believe that the $0.76 a pound projected for tomatoes marketed by the proposed system (table 3) is competitive with the $0.59 cost figure (7) for tomatoes sold under the present system (table 4). The latter price may in fact rise as high as $0.74, depending on fruit supply and other economic conditions. On the other hand, the projected retailer cost and margin in table 3 could be lower. The retailer is losing as much as $0.18 a pound due to unmarketable fruit under the present system. Studies have shown retail losses of 6 to 30 percent (1, 8, 9) in the present system. One study indicated that as much as 70 percent of the retailed tomatoes had visible physical damage (9). If losses from decay and shriveled fruit are added, total loss could reach 90 percent. Apparently, the consumer is buying a high percentage of fruit with visible physical defects. The question is, "Does the consumer buy such tomatoes because the choice is limited and other sources of fresh tomatoes are not available?" In the proposed system, tomatoes will be of high quality with less than 2 percent loss guaranteed to retailer if handled during a specified time period according to specification. Because all packages will be dated when packed, the consumer as well as the retailer will know the freshness of the fruit. We believe that because loss will be low, retailers may well lower their cost plus margin to $0.08 a pound and thus lower the price to $0.67 a pound.

The difference between the two systems in price per pound of tomatoes will be $0.08 to $0.15. However, the consumer soon learns that the lower priced tomatoes may really be the more expensive. If the consumer loses one of the four tomatoes packaged under present conditions, the cost per pound would really be $0.74, not $0.59.

Could the new system be profitable to all concerned? Growers would receive as much as, if not more than, they now receive per pound. They would no longer be involved in the harvesting and could spend their efforts on culture of tomatoes where they are the experts. The creation of the marketing system will require large investment, but the return of $0.07 per pound should be great enough for investors. All the segments of the new systems should be satisfied. The labor force will have better working conditions, at good salary and security. The marketers should realize a profit and with little competition from the present system's tomatoes. Retailers will be able to furnish consumers a good tomato at less cost, and consumers will be receiving a fresher, higher quality tomato at a fair price.

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TABLES

Table 1.--Summary of projected harvesting labor costs for labor inputs required for projected tomato harvesting unit[1/]

Personnel	Number	Hourly wage rate	Total hourly cost	Daily cost[2/]	Cost per pound packed[3/]
		Dollars	Dollars	Dollars	Dollars
Picker/graders	36	5	180	1,440	0.0439
Sorter/packers	36	5	180	1,440	.0439
Loaders	3	5	15	120	.0037
Foremen	3	7	21	168	.0052
Quality controller	1	7	7	56	.0017
Semimechanical harvester/packer operators	3	6	18	144	.0044
Over-the-road drivers	6[4/]	8	48	288	.0088
Clerks	2	5	10	80	.0024
Business manager	1	8	8	64	.0019
Unit manager	1	15	15	120	.0037
Total personnel	92	--	---	3,920	.1195
Fringe benefits[5/]	--	--	---	784	.0238
Total	--	--	---	4,704	.1433

1/ 1 harvesting unit consists of 3 semimechanical harvester/packers and 1 preharvester washer.

2/ Based on 8-hour day.

3/ 34,560 consumer units (1 pound each) harvested per day, and 32,832 units packed out.

4/ 2 over-the-road drivers must be at unit on any day. Standard crew consists of 2 drivers plus 1 swingman per rig.

5/ Fringe benefits at 20 percent of cost.

Table 2.--Estimated hourly ownership and operating

Equipment	Replacement cost[1/]	Life[1/]	Ownership cost			
			Depreciation[2/]	Insurance[3/]	Interest[4/]	Taxes[5/]
	Dollars	Years	Dollars	Dollars	Dollars	Dollars
1 Field washer	50,000	4	12,500	500	2,500	1,500
3 Harvesters	375,000	4	93,750	3,750	18,750	11,250
8 Tractors and refrigerated trailers	400,000	8	50,000	4,000	20,000	12,000
2 Flat trailers	24,000	3	8,000	240	1,200	720
2 Tractors	24,000	5	4,800	240	1,200	720
1 Generator	10,000	8	1,250	100	500	300
1 Pickup truck with lift	10,000	8	1,250	100	500	300
1 Mobile office	20,000	10	2,000	200	1,000	600
1 Office equipment	10,000	10	1,000	100	500	300
5,000 Master containers	27,000	3	9,000	270	1,350	810

1/ Estimates and from ASAE data, D230.2 Agricultural Engineers Yearbook 1976, pp. 322-329.
2/ Straight-line depreciation with no salvage value.
3/ Insurance at 1 percent of replacement cost.
4/ Interest at 10 percent of undepreciated balance.
5/ Taxes at 3 percent of replacement cost.

costs for equipment required for 1 harvesting unit

Total ownership costs	Operating cost		Total operating costs	Total ownership and operating costs	Hours of operation[8]	Cost per hour of operation
	Power[6]	Maintenance and repair[7]				
Dollars	Dollars	Dollars	Dollars	Dollars	Hours	Dollars
17,000	5,000	14,400	19,400	36,400	1,920	18.96
127,500	37,500	108,000	145,500	273,000	1,920	142.19
86,000	[9]	[9]	[9]	86,000	1,920	44.79
10,160	---	360	360	10,520	1,920	5.48
6,960	2,400	360	2,760	9,720	1,920	5.06
2,150	1,000	150	1,150	3,300	1,920	1.72
2,150	1,000	150	1,150	3,300	1,920	1.72
3,800	---	300	300	4,100	1,920	2.14
1,900	---	150	150	2,050	1,920	1.07
11,430	---	405	405	11,835	1,920	6.16

6/ Power (fuel) at 10 percent of replacement cost.
7/ Maintenance and repair at 1.5 percent of replacement cost per 100 hours of operation for field washer and harvesters and 1.5 percent for other equipment.
8/ 240-day year at 8 hours per day for 1,920 hours.
9/ Operating costs are included in over-the-road costs for tractors as a part of transportation.

Table 3.--Summary of cost analysis for per-pound price of tomatoes in proposed system

Component	Daily or trip cost	Per pound[1/]
	Dollars	Dollars
Purchase of tomatoes[2/]	3,053.38	0.0930[1/]
Harvest and pack:		
Labor[3/]	4,704.00	.1433[1/]
Equipment[4/]	1,834.32	.0558[1/]
Materials	1,313.28	.0400
Transport and deliver:		
Labor[5/]	1,382.40	.0600[6/]
Operating[7/]	805.00	.0349[6/]
N.O.I.B.N. cost[8/]		.1000[9/]
Overhead (administrative and selling)		.0200[9/]
Cost to harvesting and packing		.5470
Harvesting and packing cost margin		.0700
Price to retailer		.6170
Retailer cost + margin		.1450
Projected price		.7620

1/ Calculated on a daily harvest of 34,560 pounds and allocated to a pack-out of 32,832 pounds (consumer units).

2/ Purchase tomatoes harvested for $0.093 per pound ($0.074 cost plus $0.019 profit per pound (2)).

3/ From table 1.

4/ From table 2.

5/ Drivers paid at straight time plus 20 percent for fringe benefits for 144 man-hours.

6/ Calculated on a truckload of 960 master containers holding 23,040 pounds (consumer units).

7/ Calculated on a 2,300-mile round trip (to transport and deliver 1 truckload and return with empty master cartons) at dollars per mile for operating (not ownership costs).

8/ Not Otherwise Identified By Name cost embraces a factor to cover other costs which we have not been able to pinpoint but feel will be encountered (such as cost of short fall years, both in duration and production).

9/ Estimates.

Table 4.--Cost[1/] and return for marketing mature-green fresh tomatoes under current system

Marketing phase	Approximate cost per pound
	Dollars
Fruit procurement cost and return	0.06
Packing plant cost and return	.07
Transportation charges	.04
Wholesaler's cost and return	.10
Retailer's cost and return	.32
Total	.59

1/ Some of the cost data were derived from Jesse and Marchado (7).

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